R0064
$92 0064

CLYMER

TRAILBIKE TRAIL STANDARDS FOR THE ALLEGHENY NATIONAL FOREST

BY

DON A. CLYMER
ASSISTANT RANGER (RM)

MARIENVILLE RANGER DISTRICT
ALLEGHENY NATIONAL FOREST
MARIENVILLE, PA 16239

MARCH, 1981

80

ACKNOWLEDGMENTS

This project would not have been possible without the assistance of Garnet Wood, Allegheny National Forest Soil Scientist, who really began the work in his Soil Intrepretations for Off Road Vehicle Use. I really appreciate his council and advice during innumerable field trips and ra: sessions, as well as direct input into this paper. David O. Cotterman, Marienville District ORV patrolman, contributed to the design of the structure as well as developing an understanding of the problems. Thanks to all the District personnel who assisted in the report and especially to Marjie Raught and Carol Hilyer for typing. And finally, a special thanks to my good friend Elaine Salico, who drew the pen sketches of the structures.

TABLE OF CONTENTS

	PAGE
ABSTRACT	i
INTRODUCTION	1
Purpose	2
LITERATURE REVIEW	4
METHODOLOGY	6
STANDARDS	8
A. Location	8
B. Design	9
C. Soil Descriptions	11
D. Structures	15
E. Use Management	21
F. Signing	22
SUMMARY	23
LITERATURE CITED	24

Abstract

The Allegheny National Forest Off-Road Vehicle Policy provides for the establishment of 250 miles of ORV trail. The proposed standards provide guidance and direction for planning and developing Trailbike trails on the Forest. The standards are tied closely to the soil types found on the Forest in order to provide the best possible correlation with construction and maintenance costs.

INTRODUCTION

The Allegheny National Forest Off-Road Vehicle Policy was established through a planning effort that resulted in an Environmental Impact Statement, dated March 24, 1977. The policy is to permit only motorcycles (trailbikes) and registered snowmobiles on designated Off-Road Vehicle Trails within certain locations on the Forest and to prohibit all cross-country motorized vehicular use. The policy provides for the establishment of ORV trail facilities for both casual and long distance trailbike riding. The following summary is taken from pg. 82 of the EIS.

ORV TRAIL/ROUTE SUMMARY

General Location	ORV Trail Potential	Existing Roads	Total Roads/Trails
CASUAL RIDING:			
(1) Marshburg-Stickney	25	35	60
(2) Westline	30	50	80
(3) Highland-Owls Nest-Twin Lakes	15	45	60
(4) Blue Jay-Duhring	65	50	115
(5) Grunderville-Chapman	15	15	30
Sub-Total	150	195	345
LONG DISTANCE RIDING:			
(1) Cross-Forest Route	100	100	200
Sub-Total	100	100	200
Grand Total	250	295	545

These trails are to be comprised of the following travelways:

1. Portions of existing utility rights-of-way.
2. Abandoned logging, old oil and gas roads, and abandoned railroad grades.
3. Existing roads.
4. New trails, where necessary.

Unlicensed trailbikes will be limited to ORV trails exclusively. Such unlicensed vehicles will not be permitted to operate on roads open to public use in any intensive use area even though such a road is part of a loop trail.[1/]

[1/] U. S. Forest Service, 1977. Off-Road Vehicle Policy Allegheny National Forest. USDA Forest Service Environmental Statement 215p.

Trails will be selected through an EA procedure, and designated by working cooperatively with organized ORV groups and individuals.[1/] Very little formal construction will be needed to establish most ORV trails.[1/]

In 1978 the 25 mile Marienville Trail (Blue Jay-Duhring) and the 13 mile Rocky Gap Trail (Grunderville-Chapman) were opened to use, and in 1980 the 18.5 mile Mead Run Trail (Westline) was opened.

Maintenance of these trails has been much more expensive and time consuming than envisioned during the planning process. On the Marienville Trail approximately 1,600 mandays and $6,000 have been spent on maintenance each year since the trail opened. This maintenance impact is primarily due to the high annual rainfall (43 inches)and soils containing large percentages of silt.

Trail locations that appeared solid during layout later failed, and even locations that held up well under 1 or 2 years of trailbike use suddenly turned into muddy rutted areas which steadily deteriated.

During the planning period, soil interpretations of proposed ORV areas were done, and problem areas were indicated; however District personnel had no experience in using these interpretations, in how to solve trail location problems, or in building trailbike trails. In addition the policy in the EIS led personnel to believe that very little construction or maintenance would be needed.

Implementation of the ORV policy has been hindered by the lack of Forest direction and standards for building and maintaining trailbike trails. The problems created by local conditions, and measures needed to mitigate these problems need to be fully realized and documented, so that land managers can plan intelligently and implementation can proceed as planned.

Purpose

This paper will document the trail tread problems encountered on the Allegheny National Forest and structures and corrective measures found to be most effective. It will also incorporate other standards not affected by local conditions in order to present a useful guide to the manager.

Some of the constraints on this paper are that it be:

[1/] U. S. Forest Service, 1977. Off Road Vehicle Policy Allegheny National Forest. USDA Forest Service Environmental Statement 215p

1. Useable as the basis for a Forest Manual Supplement on Trailbike Trail Standards.
2. Understandable by District Trail Managers and field personnel.
3. Useable by managers to solve trail tread problems before establishing the trailbike trail.
4. Fulfill requirements for the Recreation Short Course.

LITERATURE REVIEW

The earliest publication I used was "A Trail Rider's Guide to the Environment" by Bennett (1973). This guide is written in interesting, entertaining English, and explains almost every environmental concern in detail. However, it glosses over the investments necessary to prevent resource damage, and does not offer solutions for the manager.

Schwarzhoff (1973) tested soil stabilization for trail tread using various chemicals. Portland cement plus calcium chloride proved best, but tests have yet to be done on our soils to determine the most effective chemical stabilizer.

Rasor (1974) and Bury & Fillmore (1975) reported on considerations for design and location of trailbike trails. Although they primarily considered parks and riding areas, rather than trails, their concerns for planning, varied experience levels, signing, and use management are basic to our trail management objectives.

Rasor (1974) and McEwen (1978) reported on management of trailbike facilities in differing locations in the United States. All the areas had suitable soils or rainfall except Washington State. Jewett (1977) and Olympia Two-Wheelers Motorcycle Club (1978) went into more detail on how Washington solves many of the same problems we face. They use a gas tax and vehicle registration receipts to build trail treads at high investment levels using Morrision Trail Builders and structures requiring considerable labor. Many of their standards and designs are identical to ours and our needs. I also read with interest the report in the Recreational Trailbike Planner (1980) on the Washington Trail Building Workshop. Joe Wernex stressed considerations on trail loops, wheelguards, tilted or angled structures, primitive appearance, challenges, and meandering trails that are important to our trail management.

The Pennsylvania Trails Program recently published (1980) an Introduction to Planning and Development of Motorized Trails that parallels our Environmental Analysis procedure in stressing resource consideration during alternative analysis. This document is good guidance for clubs or organizations without planning guidelines.

The Eastern Region Travelway Guides routed to Forests in August 1980 in draft form make a good presentation of general guidelines and

format. The R9 guides only lack specific standards relating to Allegheny soil conditions. When these guidelines are refined and adopted, they should be compatable with the Allegheny Trailbike Standards proposed in this paper.

METHODOLOGY

While managing the Marienville Trailbike Trail in 1979 and 1980, I began to see the need for some designs and/or standards for trailbike trails on the Forest. We were developing new and innovative structures, which later turned out to have been in use for many years elsewhere. Our lack of experience and training led us into a situation where we were trying to solve the "surprise" problems in one area while continuing to place trails in other areas that would lead to more "surprises" later on. The reason we were often "surprised" was that even people experienced in trailbike riding and maintenance very rarely had to deal with the combination of silt soils and abundant rainfall found on the Allegheny National Forest.

One person who shared my learning experience on the trailbike trail was Garnet Wood, Forest Soil Scientist. Together we watched areas we thought were stable treads turn into soup. In order for the needed standards to be fully effective on this Forest they will need to be closely tied to the local soils, and Garnet Wood will need to be actively involved in developing them.

In October of 1980 Garnet Wood and I spent 3 days closely reviewing the Marienville Trailbike Trail. He checked his initial soil interpretations, impact of use on the soils, and we evaluated the effectiveness of different structures and corrective measures.

When the Ridgeway District opened it's Mead Run Trail in 1980, I was very interested in checking the trail location to see if the Forest was making use of the knowledge we had gained from operating the other two trails for 2 years. I rode the trail in November 1980 with Russ Adams, Ridgway District Assistant Ranger, Garnet Wood, and Dave Cotterman, Marienville Ranger District ORV Patrolman.

The new trail had very little use, approximately 50 bikes, and many areas were already in need of tread work or structures. Other sections needed to be relocated onto better soils in order to avoid excessively long structures or tread work.

The review of the Mead Run Trail assured us that the tread problems we were experiencing on the Marienville District were a Forest-wide problem, and that the Forest was not profiting from experience.

After the field work we discussed the maintenance problems, and developed a format for presenting the recommended standards in such a manner that they are tied to the soils. We are still faced with the

problem of how to convince managers that soils that look and seem solid will fail under sustained trailbike use, and will eventually require costly tread work or structures. Hopefully this paper is a start in documenting these problems, and future experience, workshops, and documentation will expand the knowledge and expertise of trail managers.

STANDARDS

The Eastern Region is collaborating with the Pacific Northwest Region and several trail-interest groups in developing Travelway Guides and Region 9 (Eastern Region) distributed a draft version of these guides in August 1980. I hope that these guides and the standards proposed in this paper can be integrated in the Allegheny Forest manual supplement on trail standards for trailbikes.

A. Location.

Trailbiking is a trail orientated activity, requiring challenge in diverse natural settings to meet the riders needs. Forest trailbikers seek scenery, but primarily interact with the terrain under the wheel. For most participants a demanding trail which challenges the rider, and a trailbike designed for rough travel are an integral part of the experience.

Providing a quality experience for the trailbiker while protecting the resource from damage is the challenge faced by trailbike trail managers. If the trail is improperly planned or constructed, damage to the resources will occur. Anticipation of potential impacts followed by proper planning and management will minimize adverse effects to acceptable levels or eliminate them entirely.[1/] The following items need to be considered when selecting a location, or comparing alternative locations:

1. Avoid soil types 2, 7 and 8 as much as possible in order to hold down costs of structures and tread work.

2. Provide loop trail systems.

3. Provide trailhead parking.

4. Select design level (novice, expert, etc.) and stay within design specifications.

5. Avoid the necessity for trail bikes to travel on Forest roads open to traffic and subject to legal requirements.

6. Provide for maximum diversity of the trail experience in tread surface and environments encountered.

[1/] Eastern Region. 1980. Travelway guides. U. S. Forest Service Region 9. unpublished. 59 p.

7. Avoid critical wildlife habitats, or other conflicting uses.

8. Avoid flat areas and meadows, locate on side hills where the trail can be drained.

B. Design

Design levels are intended to provide recreationists with facilities that cover a full range of experiences. They can, therefore, choose which they would like and be assured that their expectations will be realized. The three levels are rated by difficulty: Easy, More Difficult, Most Difficult.

Easy Trails

These trails require standards and maintenance levels that will accomodate moderate to heavy traffic. Socializing with others may be a part of the recreation experience and contact with others may be frequent. It will be obvious to the user that he is on a safe and well marked trail. Comfort and convenience may be provided for users. 1/

More Difficult Trails

These trails require standards and maintenance levels that will accomodate moderate use. The route will only modify natural conditions to the extent necessary to protect the environment, and provide for safe use by those with experience and good physical ability. Users should expect to find a blending of opportunities to both socialize and have a moderate degree of solitude during low use periods. Trailhead facilities will be provided only for resource protection and as a means to inform users of conditions. 1/

Most Difficult Trails

These trails will be maintained only for resource protection and to provide safe use by individuals seeking an experience in rugged terrain. The route, particularly at the start, should appear as a primitive facility. The modification of natural environment should be kept to an absolute minimum. The user should expect moderate contacts with others only during peak use periods. The route should provide an opportunity for testing skills, and require good physical conditioning. 1/

1/ Eastern Region. 1980. Travelway guides. U.S. Forest Service, Region 9 Unpublished. 59 p.

SPECIFICATIONS BY DESIGN CLASS

R.O.S.	Modern ←		→ Primitive
	Easy	More Difficult	Most Difficult
Grade sustained	8%	12%	15%
short pitch	15%	30%	50%
Clearing width	4'	4'	3'
height	9'	8'	8'
Tread width Min.	18"	18"	12"
Max.	30"	24"	24"
Tread Surface	Smooth, no roots or rocks larger than 3". Avoid sand & loose Material.	Some rough sections. Some loose materials or mud. Some dips.	Rough with some very rough. Loose materials, mud, dips where available.
Obstacles	None	Small logs or rocks up to 6", flat on trail. 1-5/mi.	Logs up to 12" lying flat 1-5/mi. Rocks or ledges up to 12"

Grade

The objective is to provide variety and challenge, avoiding long sustained grades or flat trail sections.

Clearing

Clearing and tread width should vary with design class and with alignment and grade. Switchbacks and sharp corners should receive extra wide tread and clearing.[1/]

[1/] Eastern Region. 1980. Travelway Guides. U.S. Forest Service Region 9. Unpublished. 59 p.

Length

Providing cutoffs on a system of loop trails allows user needs for different distances and degrees of challenge to be accomodated.[1/]

The average male will ride approximately 50 miles per day and the average female 28 miles per day.[1/] The point is to provide a variety of loops so that users can choose the route that suits their capabilities and needs.

C. Soil Descriptions

The soil interpretations which have been mapped for the "Intensive Use Areas" on the Forest (Wood 1974) should be used to select a proposed trail corridor, or proposed alternative corridors. Then the proposed routes should be located within the corridor or corridors, keeping in mind the points listed under "A". The soils should be mapped in more detail along the proposed alternative routes on a large scale overlay (4"/mile).

The soil descriptions, recommended structures, and average costs of trail construction on various soil types can then be used to compare alternative routes or corridors.

Other factors will have to be considered in choosing alternatives and documented and included in the analysis, but since the soil had the most direct effect on the cost of trail construction, and this cost is the most tangable criteria for comparing alternatives, this information must be considered in the decision making process.

The soil interpretations are based on nine (9) soil units, with each unit consisting of a soil or group of soils of similiar characteristics. Following is a list of the soil series present in the soil units:

1/ Eastern Region. 1980. Travelway Guides. U. S. Forest Service Region 9. Unpublished. 59 p.

SOIL UNIT	RANGE OF SOIL SERIES PRESENT
1.	Gilpin Soils, Cookport Soils
2.	Ernest Soils, Fredon Soils, Stkins Soils
3.	Cookport Soils, Ernest Soils, Phils Soils
4.	Hazelton Soils, Clymer Soils, Cookport Soils
5.	Hazelton Soils, Clymer Soils, Gilpin Soils, Cookport Soils
6.	Hazelton Soils, Clymer Soils, Gilpin Soils
7.	Ernest Soils, Cookport Soils, Wharton Soils, Gilpin Soils
8.	Armagh soils, Brinkerton Soils, Cavode Soils, Ernest Soils
9.	Cookport Soils, Gilpin Soils, Wharton Soils

Soil Unit 1

The soil or soils within this delineation are well drained. The watertable is below 30 inches of the surface. Depth of bedrock occurs generally greater than 3 feet. Surface and subsurface rocks occupy 25-50% of the area. Slopes range 15-60% plus.

Trails on this soil unit can withstand heavy use, are steep, slippery when wet, and need to be developed on the contour. These soils can be designed for hill climbs.

Structures needed are culverts, open top culverts, dips and curbing to maintain tread on a sideslope.

Construction costs are $.12/ft ($630/mile).

Soil Unit 2

The soil or soils within this delineation are poorly drained with watertable at or less than 18 inches of the surface. Permeability is slow. Slopes range 5-25%.

These soils allow deep rutting, ponded waters and mud holes which become deeper with use because of a soft bottom. Use is severly restricted unless structures are properly designed for sufficient drainage and removal of waters from the trail.

Structures needed are puncheon, turnpiking, and culverts.

Construction costs are $1.80/ft ($9,500/mi).

Soil Unit 3

The soil or soils within this delineation are well drained. The watertable is deeper than 18 inches below the surface. Depth to bedrock is greater than 3 feet. Permeability is slow, surface stones occupy 10 to 15%of the area. Slopes range 5 to 30%.

Ponding or mud holes occur in small depressions which have firm bottoms. Use will require continued filling or draining of pot holes on easy design class trails.

Structures needed are the open top culvert for surface water drainage and culverts on spring and seep areas, and turnpiking.

Construction costs are $.03/ft ($150/mile).

Soil Unit 4

The soil or soils within this delineation are deep and well drained. The watertable is deeper than 3 feet. Permeability is moderate to rapid. Depth of bedrock is generally greater than 4 feet. Surface stones occur in isolated areas. Slopes range 15 to 50%+.

Trail problems are steep side slope and areas of large boulders. Slopes are slippery when wet and need erosion control measures. Trails must be developed on the contour.

Structures needed are open top culverts, culverts, dips, and curbing to maintain tread on side slopes.

Construction costs are $.10/ft ($528/mile).

Soil Unit 5

The soil or soils within this delineation are deep well drained sandstone material. The watertable is deeper than 3 feet. Permeability is moderate. Depth to sandstone bedrock is greater than 3 feet. Slope ranges from 5 to 30%.

On this soil unit ponding or mud holes occur in small depressions and enlarge with use. The bottoms are generally firm. Use will require the routine filling or draining of potholes on easy design class trails.

Structures needed are turnpiking, open top culverts for surface water drainage and occasional culverts in those areas of seeps or springs.

Construction costs are $.03/ft ($150/mile).

Soil Unit 6

The soils or soil within this delineation are excessively well drained soils derived from weathered sandstone material. Water-table is deeper than 4 feet. Depth of bedrock ranges from 18" to 3 feet. Slope range 20-60%+.

Erosion on steep slopes is the main problem. Erosion control structures are needed to protect the trail tread.

Structures used would be anchored fencing on problem areas and dips. Filling of eroded trail tread with native material will be occasionally needed.

Construction costs are $.C4/ft ($200/mile).

Soil Unit 7

The soil or soils within this delineation are deep moderately well drained. The watertable is within 18 to 36 inches of the surface. Permeability is slow, slope range if 0 to 20%.

Long ruts are a persistent problem with mud holes developing along the ruts. Mud holes progressively get larger but have firm bottoms.

Structures needed are puncheon, culverts, open top culverts, and turnpiking. Structure placement within this soil unit is difficult to determine until use is established and tread areas develop failure.

Construction costs are $.30/ft ($1,580/mile).

Soil Unit 8

The soil or soils within this delineation are poorly drained formed in acid sandstone and shale material. The watertable is at or less than 10 inches of the surface. Permeability is slow. Slopes range 0 to 10%.

These soils are swampy and unsuitable for use unless artificial tread is provided.

These soils should be avoided or crossed at narrowest points possible.

The only structure suitable is puncheon placed on mud sills spaced a maximum of 8 feet.

Construction cost is $15.00/ft ($79,200/mile).

Soil Unit 9

The soil or soils within this delineation are well drained formed in sandstone and thin shale material. Watertable is deeper than four feet. Depth to bedrock ranges from 3 to 5 feet. Surface stones and rocks are common, slope range 5 to 50%+.

Trails on this soil unit withstand heavy use, are generally steep, slippery when wet, and become entrenched from erosion.

Use can be designed for hill climbs.

No structures are generally needed, since routine tread work may be needed due to erosion.

Construction costs are $.03/ft ($150/mile).

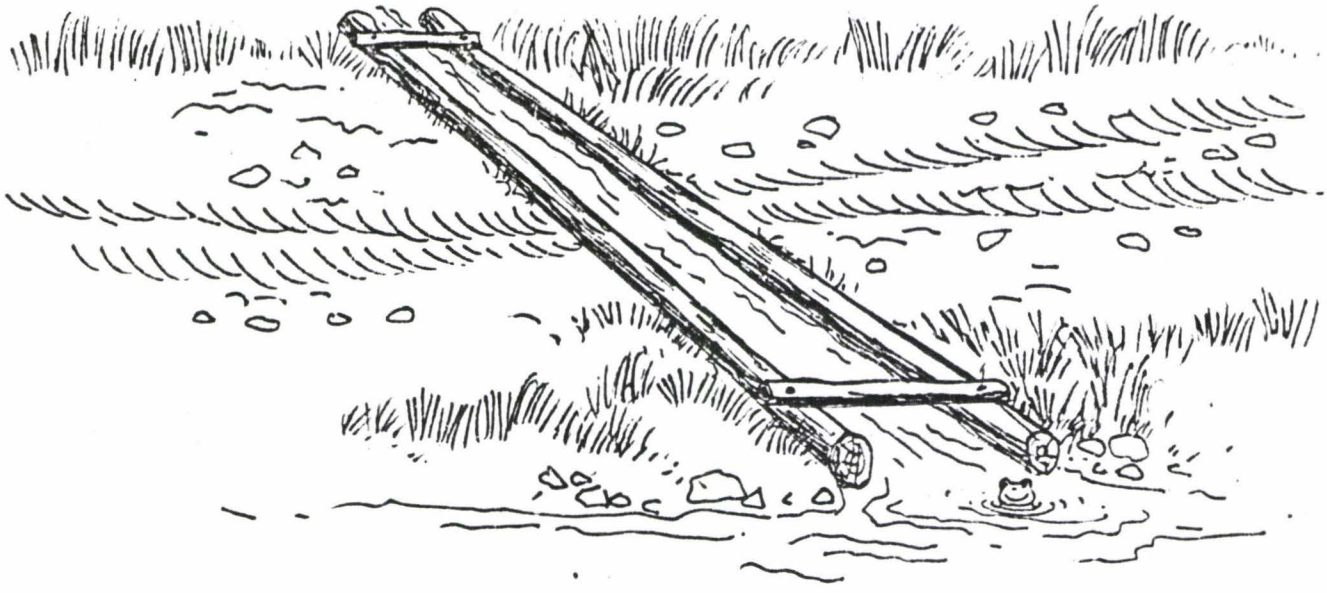
D. Structures

The structures mentioned in the soil units are the primary means to mitigating tread failure, but are also the main cause of high construction and maintenance costs. It is therefore very important that structures are used properly, and built correctly to hold down unnecessary costs. The following structures are the ones I have found most useful, although other designs are often useful and specific areas often need modification of these designs. In the discussion of each structure I will try to mention the different modifications possible, when they are used, and why.

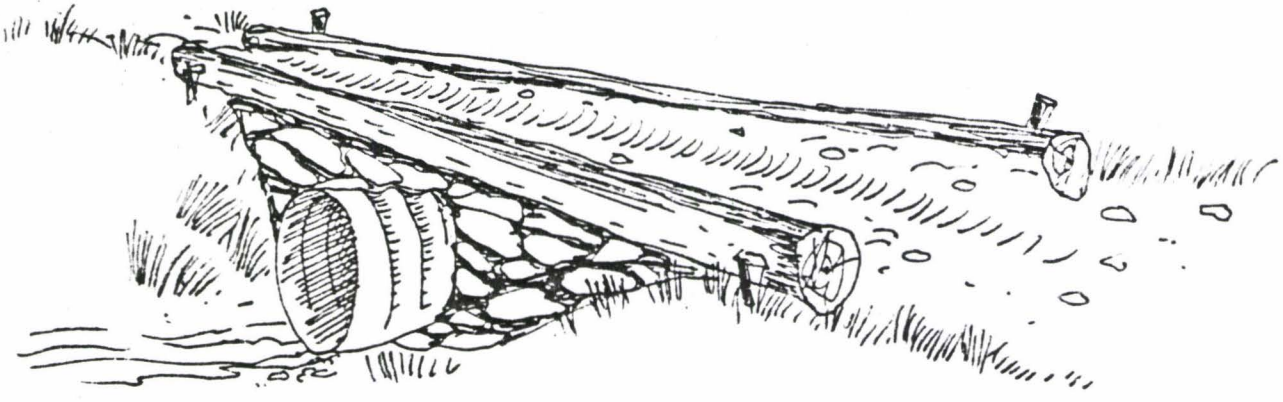
1. Open-top culvert

This is a simple structure to allow water to cross the trail. The size of the logs depends on the volume of water, but the

1. OPEN-TOP CULVERT

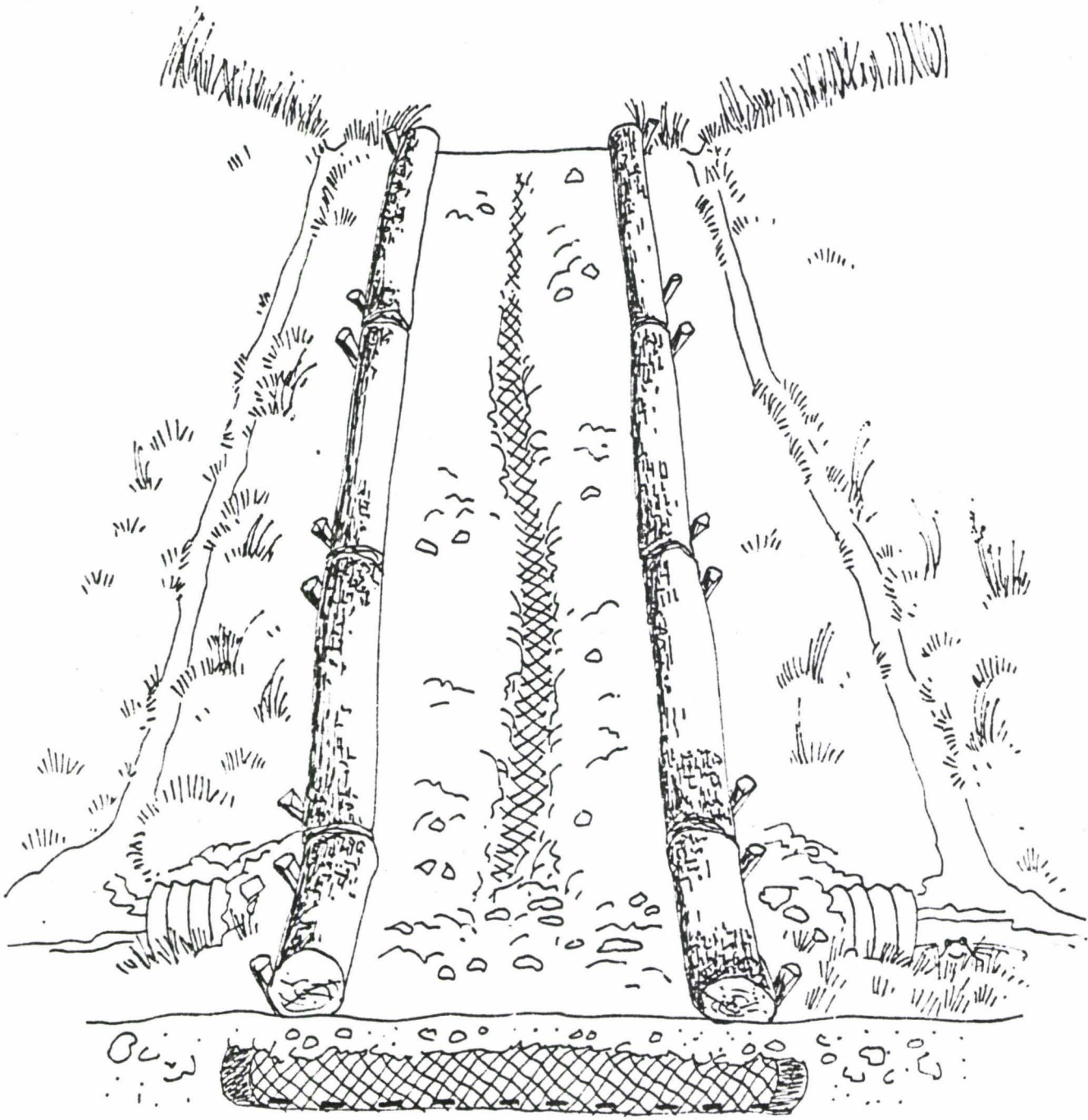


2. CULVERT



E. Salico

3. FENCE ON STREAMBANK



L. Salico

top limit should be about 10 inches. This culvert requires frequent cleaning to keep it effective. Its advantage is that only an axe and spikes are needed to construct it, and grubbing and earthwork are less than for a pipe culvert.

Open-top culverts are suitable for soil units 1, 3, 4, 5, and 7.

2. Culvert

This structure is designed around used culvert pipes provided by the Forest Construction and Maintenance crew which have been sawn into six (6) to ten (10) foot lengths. They are carried into location by placing a long pole through them. At least 6 inches of fill is required above the culvert, and fencing should be placed just under the surface of the fill with either end of the fencing anchored to buried logs as shown in diagram 3. Curbing should always be provided and staked well. The stakes should be spiked to the curbing. Curb logs should be a minimum of 6 inches. On culverts larger than 18 inches the sides of the fill around the pipe should be rip-rapped with rock.

Culverts are suitable for soil units 1, 2, 3, 4, 5 and 7.

3. Fence on Streambank

Heavy (9 gauge) chain link fencing buried just beneath the tread surface is ideal for preventing rutting and digging of the tread. The ideal use is on a steep streambank as shown in the diagram. In this situation any erosion or displacement of soil becomes siltation in the stream, so preventing tire spin is very important. Fencing should also be used on fill sections over culverts, and at the ends of puncheon. At these locations, holes develop unless the tread is protected.

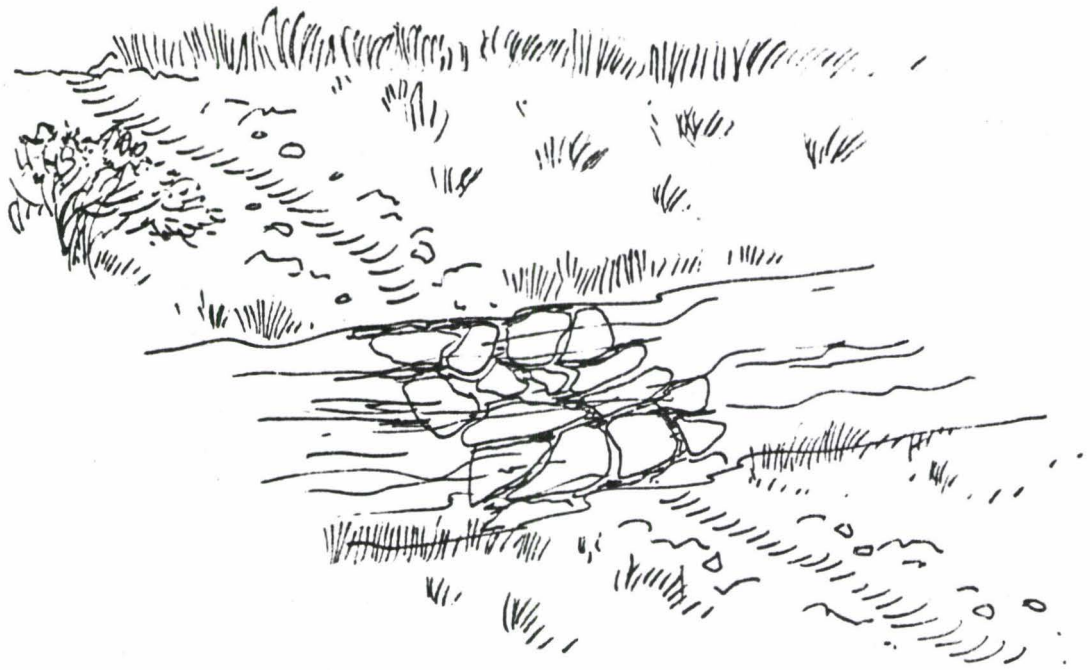
Fencing is suitable for soil units 1, 2, 3, 4, 5, 6 and 7.

4. Paved Stream Crossing

Large streams may be crossed by paving the stream with stones if the banks are not too steep. The banks may need fencing to prevent erosion into the stream if the soil is not stony, or the banks are steep.

If the banks are too steep for this crossing, or swamps surround the stream, then a bridge must be used. Bridges are individually located and designed by the forest engineering staff, and their design will be requested and followed in construction.

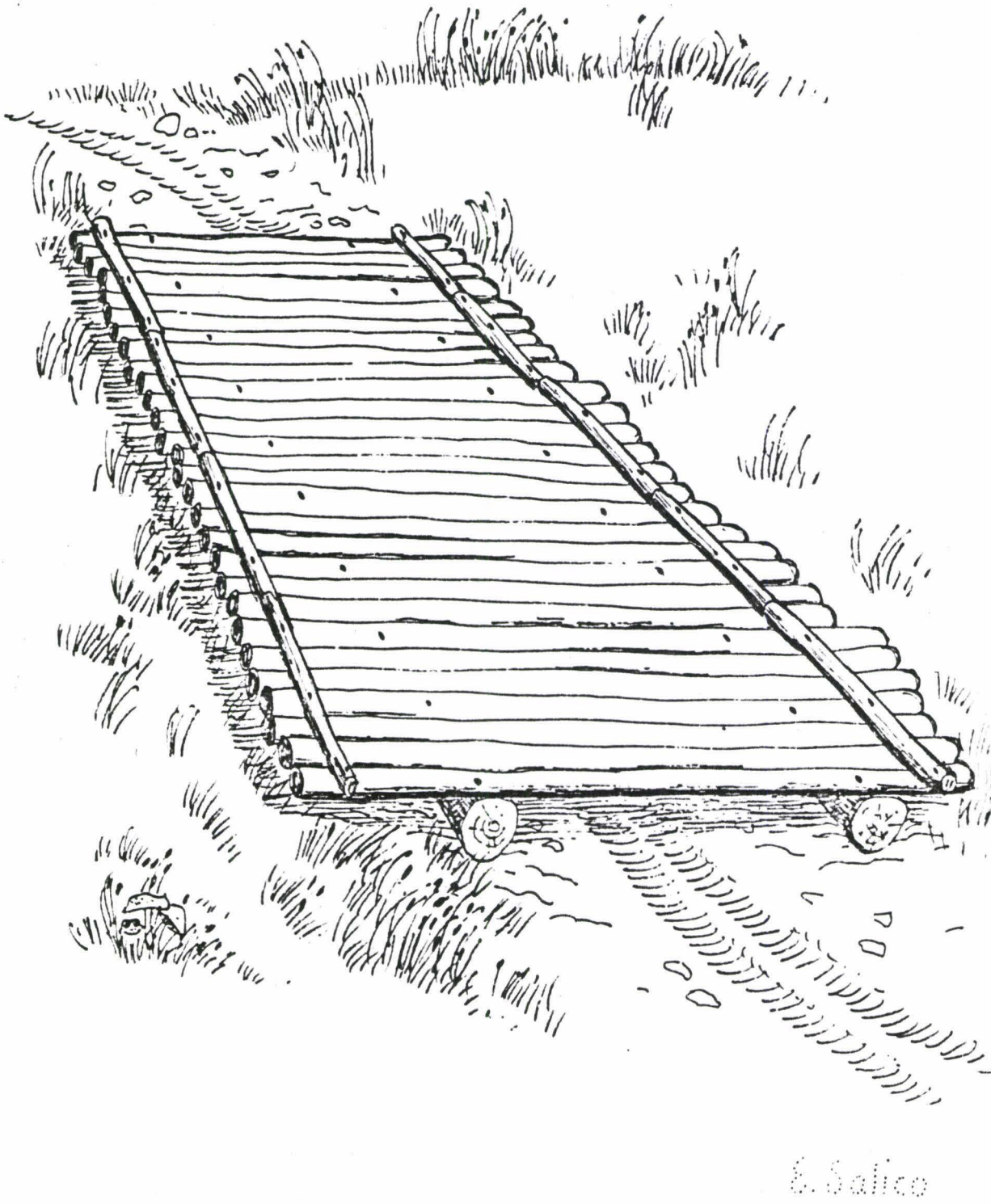
4. PAVED STREAM CROSSING



5. TURNPIKE

E. Salico

6. PUNCHEON



5. Turnpike

This structure is ideal where the trail tread will not withstand use. In soil units 3, 5 and 7 the turnpike can be built up with soil from the area, but in soil units 2 the turnpike must be rock or stone. This stone can be commercially bought and wheelbarrowed to the site (up to 1/4 mile maximum) or broken rock from nearby. The curbing should be spiked to the stakes, and sized according to the desired thickness of the stone.

The decision to use turnpike or puncheon as tread armor is dependent on the availability of stone or timber. Turnpike is longer lived and therefore more desirable.

Turnpike is suitable for soil units 2, 3, 5 and 7.

6. Puncheon

Puncheon as shown in the drawing is recommended in situations where the soil will not support a tread. Corduroy is not recommended as the logs settle unevenly into the mud and holes and make riding difficult, and since they are often also wet, very hazardous. The stringer logs should be at least 6 inches, curbs at least 4 inches. Also, note that every third tread log is spiked to the stringers. On soil unit 8, the only bearing surface is the sod which must be kept alive by supporting the puncheon on mud sill logs 12 inches diameter and larger placed at least every 8 feet. In some installations the decking or all of the structure may be made from rough sawn pressure treated wood instead of native logs.

Puncheon is suitable for soil units 2, 7 and 8.

E. Use Management

Bulletin boards should be installed at parking areas and trailheads. A map of the trail and regulations should be posted. Also a map dispenser for trail maps at the trailhead is ideal.

One way trails are safer than two-way trails, and reduce signing requirements, but the overall design of the loop system and location of trailheads may require some two-way trails.

Seasonal closures may be established for trail systems, or loops of a system. This closure season will be determined through an EA process for the protection of the resources, and therefore must be decided upon based on the specific circumstances or problems with each location.

F. Signing

Signing requirements for trailheads and parking areas should be followed in accordance with FSM 7160 and FSH 7109.11a. After the trail tread is well established, blazes along the route may be reduced. Unusual or unexpected hazards should have warning signs until they are corrected.

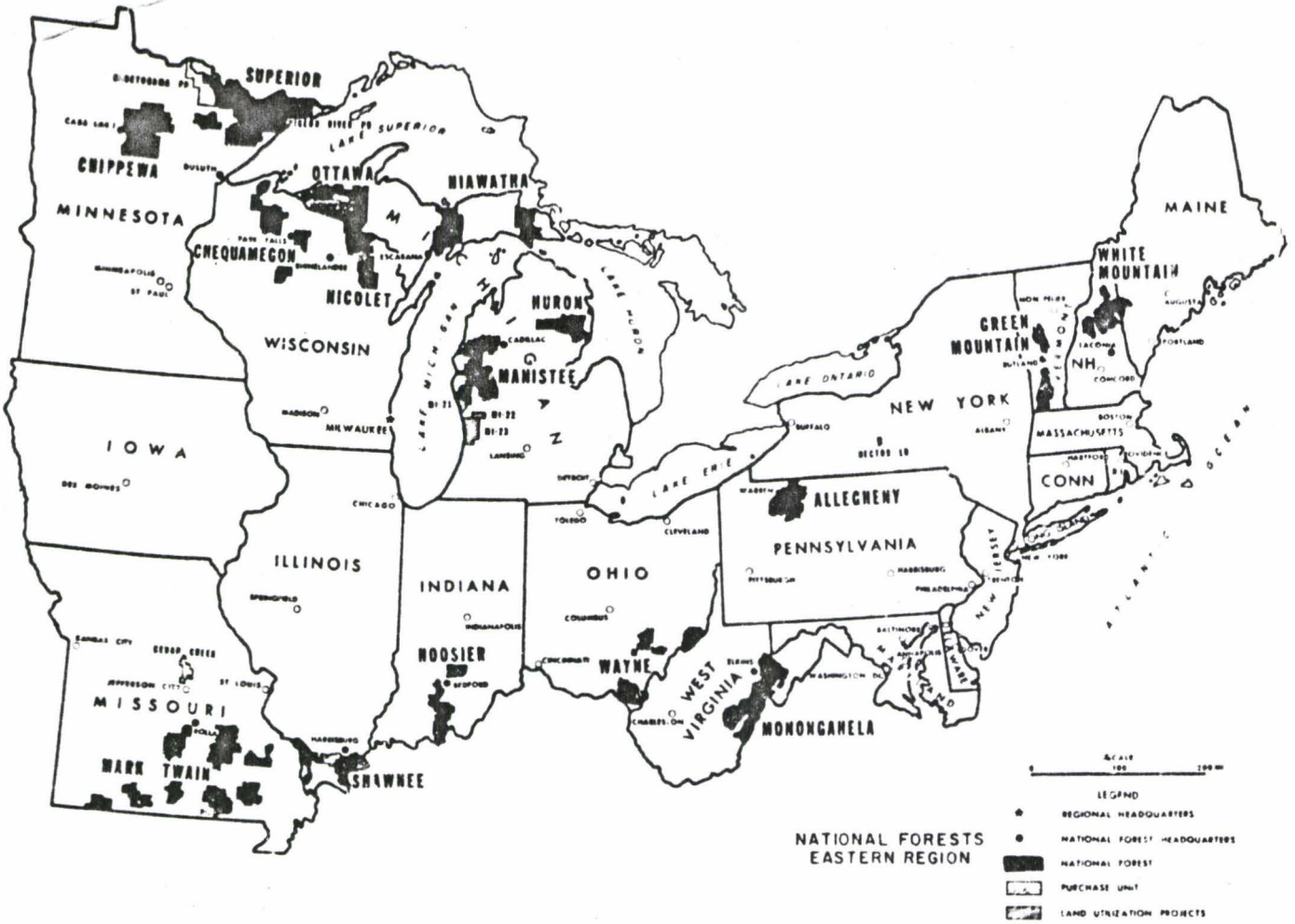
SUMMARY

This report has presented the record of trailbike trail development on the Allegheny National Forest, and discussed the problems which are preventing implementation of the Off-Road Vehicle Policy.

A literature review was conducted which showed that tread and soil problems being experienced on the Forest are not unique, but still different from most ORV areas. Some recent guides from Region 9 provide good general guidelines for standards.

The method used in developing proposed standards and the format for incorporating Allegheny National Forest soils in the standard is presented.

Standards for trailbike trails are presented in a format that should make them useful during the planning and Environmental Analysis process in alternaitve route comparisons. When the final route is selected, the standards should provide an estimated cost of construction for further project planning and planning of annual maintenance budgets. Hopefully, if the standards are used conscientiously, the proposed trail will be located in the best location, and constructed in a manner that minimal annual maintenance will be necessary.



National Forests provide a variety of uses, products, and pleasures for people. They were originally established to protect watersheds and supply timber, and they still do. But in addition, these forest lands are now rich in wildlife, forage, and recreation opportunities. These and other uses are managed by the Forest Service, U.S. Department of Agriculture. Specialists in many fields coordinate and balance uses so that all Americans will receive maximum benefits throughout the years.

R9-5-2-80-01

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
Allegheny National Forest
P. O. Box 847
Warren, Pennsylvania 16365

2330
March 9, 1981

Dr. Richard A. Conover
Department of Recreation & Park Admin.
Clemson University
Clemson, SC 29631

Dear Dr. Conover:

Attached is a copy of my report for your review. I am scheduled to present the project report at Albequerque on March 24, 1981.

I am looking forward to seeing you then.

Sincerely,

Don A Clymer

DON A. CLYMER

LITERATURE CITED

Bennett, Shaun. 1973. A trail rider's guide to the environment. American Motorcycle Association. Westerville, Ohio. 60 p.

Bury, Richard L. and Edgar R. Fillmore. 1975. Motorcycle area design and location: Impacts on the recreation experience of riders and nonriders. Texas Agricultural Experiment Station and Department of Recreation and Parks, Texas A & M University. College Station, Texas. 8 p.

Eastern Region. 1980. Trailway guides. U. S. Forest Service, Region 9. Unpublished. 59 p.

Harrison, Robin T., Clark, Roger N. and Stankey, George H. 1980. Predicting impact of noise on recreationists. Equipment Development and Test Project 2688. Equipment Development Center. Missoula, Montana. 32 p.

Jewett, Ann, Ron Jewett and Chuck King. 1977. Field guide for routine recreation trail maintenance. State of Washington. Department of Natural Resources. 42 p.

McEwen, Douglas N. 1978. Turkey bay off-road vehicle area at land between the Lakes; An example of new opportunities for managers and riders. Southern Illinois University at Carbondale. Res. Rep. No. 1. 28 p.

Motorcycle Industry Council, Inc. 1980. Washington Trail Building Workshop "Works". The Recreational Trailbike Planner. Vol. 1:12. pp. 1-2.

Olympia Two-Wheeler's Motorcycle Club. 1978. Suggested specifications for Trailbike Trunk Trail. American Motorcycle Associaton. Westerville, Ohio. 5 p.

Rasor, Robert. 1974. Public motorcycle parks: Safety through planning. National Safety Congress Transactions. Vol. 27. 3 p.

Rasor, Robert. 1977. Five state approaches to trailbike recreation facilities and their management. American Motorcylcle Association. Westerville, Ohio. 64 p.

Schwarzhoff, J. C. 1973. Soil stabilization of organic soils for trail stabilization. Engineering Technical Report - 7700-7. Division of Engineering. Portland, Oregon. 90 p.

The Pennsylvania Trails Program. 1980. Motorized trails/an introduction to planning and development. Division of Outdoor Recreation. Bureau of State Parks. Commonwealth of Pennsylvania. 50 p.

U. S. Forest Service. 1977. Off-Road vehicle policy. Allegheny National Forest. USDA Forest Service Environmental Statement. 215 p.

Wood, Garnet. 1976. Soil interpretations for ORV use. USDA Forest Service. Warren, PA 15 p.